Title: Mechanical properties of a novel magnesium WN43 alloy prepared by spark plasma sintering

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Abstract: Properties such as low modulus of elasticity, low toxicity, and biodegradability make magnesium alloys interesting candidates for medical applications. To avoid potentially harmful effects of rare earth mischmetal present in the commercial WE43 alloys, it has been replaced in this study with pure neodymium, which exhibits lower toxicity. To achieve high control over the material microstructure, it was prepared using the spark plasma sintering technique. This study focuses on exploring the mechanical properties of the novel WN43 alloy using compression and tensile testing accompanied by the acoustic emission technique. Ultimate compressive strength and ductility were observed to improve significantly with higher sintering temperatures. In order to obtain better insights into microscopic aspects of the deformation mechanisms, EBSD images of the samples were taken at multiple points during deformation. It was shown that around the yield point twin nucleation produces strong acoustic emission signal, while later stages of deformation are mostly accommodated by twin growth and dislocations.

Keywords: magnesium; sintering; deformation; acoustic emission